

RADAR Product Compression Approach

[for External NOAAPORT Satellite Broadcast Network (SBN) Users]

To reduce the current NOAAPORT SBN bandwidth utilization and allow more products to be broadcast within the bandwidth capacity of the current SBN NWSTG channel, the NWS will begin broadcasting the WSR-88D radar products in a compressed format sometime after June 1, 2000. The current encryption of radar products will continue until the NEXRAD Information Dissemination Service (NIDS) agreements are terminated which is targeted for September 30, 2000. Once the NIDS agreements are terminated the radar product encryption will be removed permanently and all products will be openly available over NOAAPORT in the compressed format.

Each radar product broadcast over NOAAPORT will be compressed prior to transmission using a nonproprietary algorithm implemented in a readily available compression scheme, i.e., zlib. Each frame of a product will be individually compressed. The zlib libraries and descriptions are available at the following web address:

<http://www.cdrom.com/pub/infozip/zlib>

The portion of the product to be compressed will include all of the product headers and user data including the Communications Control Block (CCB), WMO heading, and the NNNxxx AWIPS identifier. However, to facilitate product recognition and filtering, a clear text copy of the CCB, WMO heading, and NNNxxx AWIPS identifier will precede the compressed data. The SBN frame header information which includes frame and product sequence number information will also be broadcast in a non-compressed format per the current SBN transmission specification. The clear text user defined field 1 of the CCB will indicate whether or not the entire associated product is compressed. The clear text user defined field 2 of the CCB will indicate the offset from the beginning of the product to the compressed data (i.e., the length of the clear text header). This CCB product identification information will allow NOAAPORT users to decompress radar products at the product level following receipt of the entire product.

Note, however, that the compressed product will consist of one or more frames of data where each block of data (or data frame) is individually compressed via the zlib library compress function. Because of the inherent format of the zlib compressed data, decompressing a product consisting of multiple frames will require multiple calls to the decompression routine where the frame boundaries are self-defined. This approach will typically require the development of a small application program to read the compressed product file, perform the multiple calls to decompress the individual frames, and write the decompressed data back to disk or other media.

In addition to the compression indication in the clear text CCB header, the SBN frame header will also indicate whether or not each frame of the entire product is compressed. Since the radar products will be compressed on a frame by frame basis, the NOAAPORT user has the option of easily decompressing the data as each HDLC frame is received. The existence of compressed data frames is indicated in the transfer type field as 0x10 (to indicate frame compression via zlib library). Also, the data block offset field will indicate the offset from the beginning of the SBN frame to the compressed portion of data. Thus, the offset indicates the length of the clear text header in the first frame only of each compressed product. Therefore, a simple call to the zlib decompress library routine for each compressed frame will produce an individual decompressed frame. Once the frame is decompressed it can be handled in the conventional manner. Also each decompressed SBN data frame will not exceed the existing maximum SBN frame size since that is the maximum frame size of the original data frame.

In summary, the NOAAPORT user has two choices for selecting when to decompress radar products:

- 1) perform decompression of the entire product after the product has been completely received (and possibly stored to disk) using the information contained in the clear text CCB header at the front of the product.

- 2) decompress each frame immediately upon receipt from the SBN using the information in the SBN header, thereby avoiding the need for post arrival decompression processing and analysis of CCB headers.

Since this compression algorithm is lossless, there is no loss of product information when converting from the transmitted compressed format back to the original decompressed format. The chosen implementation of the zlib library based compression scheme allows the flexibility for the NOAAPORT user to decompress the SBN data stream at the point most suited for their needs and environment.

SBN Product Format Definition

The format of the SBN compressed product will be as follows:

Clear Text Header Format

- modified CCB (with compress indicator)
- original WMO header (TTAAII CCCC YYGGgg BBB)
- original NNNxxx

Compressed Body

- CCB (without compress indicator)
- WMO header (TTAAII CCCC YYGGgg BBB)
- NNNxxx
- product data

CCB Field Usage

- USER DEFINED field 1
 - F - zlib frame compression
- USER DEFINED field 2
 - n - offset in bytes to compressed portion of data (from beginning of product)
- CLASSIFICATION field
 - U - unclassified (not encrypted)

SBN Header Field Usage (Frame compression mode)

- Transfer type
 - 0x10 - Frame is compressed via zlib library
- Data block offset
 - n - offset in bytes to compressed portion of data (from beginning of this SBN frame), i.e., length of clear text header (only applicable to first frame of a product)